

Claims

1. A coil forming insertion device comprising a winding jig for forming a joining pole coil constructed by joining plural monopole coils each formed by winding an electric wire in a loop shape, and an inserter jig opposed to the winding jig and receiving said joining pole coil and inserting and arranging the joining pole coil in a slot formed on the inner circumferential face of a stator core;

wherein said winding jig has plural coil winding frames, and said inserter jig has plural coil receiving portions for respectively receiving each monopole coil from each coil winding frame; and

each coil receiving portion is opposed to each coil winding frame, and said joining pole coil formed by joining each monopole coil wound around each coil winding frame is constructed so as to be moved and mounted from said winding jig to said inserter jig.

2. A coil forming insertion device comprising a winding jig for forming a joining pole coil constructed by joining plural monopole coils each formed by winding an electric wire in a loop shape, and an inserter jig opposed to the winding jig and receiving said joining pole coil and inserting and arranging the joining pole coil in a slot formed on the inner circumferential face of a stator core;

wherein said winding jig is constructed by arranging

plural coil winding frames for forming said monopole coil by winding said electric wire at about the same distance from the central point of the winding jig, and is arranged such that respective winding axes for winding said electric wire in each coil winding frame are approximately parallel to each other;

said inserter jig has a pushing-out insertion core for pushing-out said joining pole coil toward said slot of said stator core and inserting this joining pole coil into the slot, and also has plural coil receiving portions arranged on the outer circumferential face of the pushing-out insertion core and respectively receiving each monopole coil from each coil winding frame; and

when said joining pole coil is moved and mounted from said winding jig to said inserter jig, each coil receiving portion is opposed to the tip face of each coil winding frame in the direction of said winding axis, and each coil winding frame and each coil receiving portion are connected to each other, and each of each coil winding frame and each coil receiving portion is constructed so as to form a moving and mounting route for moving and mounting each monopole coil.

3. The coil forming insertion device according to claim 1 or 2, wherein each coil winding frame has a fitting concave portion for fitting the tip portion of each coil receiving portion onto said tip face, and

said joining pole coil is moved and mounted from said

winding jig to said inserter jig in a state in which said tip portion of said coil receiving portion is fitted into said fitting concave portion of each coil winding frame.

4. The coil forming insertion device according to any one of claims 1 to 3, wherein said winding jig has an expelling core arranged so as to be advanced and retreated on the inner circumferential side of each coil winding frame so as to expel said joining pole coil to said inserter jig.

5. The coil forming insertion device according to any one of claims 1 to 4, wherein each coil winding frame has an inside winding frame portion arranged on the inner circumferential side as said central point side of said winding jig, and an outside winding frame portion oppositely arranged on the outer circumferential side of the inside winding frame portion, and

said outside winding frame portion can be moved so as to change the distance between this outside winding frame portion and said inside winding frame portion between a winding position in winding said electric wire and a separating position in separating said monopole coil after said winding operation is performed from the coil winding frame.

6. The coil forming insertion device according to claim 5, wherein said outside winding frame portion is stepwise increased in diameter toward the advancing direction on the side opposed to said inserter jig.

7. The coil forming insertion device according to any one of claims 1 to 6, wherein said winding jig has a turning arm arranged so as to be turned with a turning central axis connected to a turning device as a center, and also has an index holder rotatably arranged with respect to the turning arm in a state in which a rotating central axis formed in a position offset approximately in parallel with said turning central axis is set to a center,

said plural coil winding frames are arranged in said index holder in an arc shape at about the same distance from said rotating central axis, and the respective winding axes for winding said electric wire in the respective coil winding frames are approximately parallel to each other and are also approximately parallel to said turning central axis, and

each coil winding frame is arranged so as to be advanced and retreated in the direction of said turning central axis with respect to said index holder, and the coil winding frame for winding said electric wire is constructed so as to be advanced in the advancing direction on the side opposed to said inserter jig with respect to the remaining coil winding frames and is also constructed so as to be projected from the remaining coil winding frames.

8. A coil forming insertion method in which a winding jig for forming a joining pole coil and an inserter jig for inserting and arranging said joining pole coil in a slot formed

on the inner circumferential face of a stator core are used,

plural monopole coils are formed and the joining pole coil constructed by joining the plural monopole coils is also formed by winding an electric wire around each of plural coil winding frames arranged in said winding jig, and

each monopole coil held to each coil winding frame is simultaneously delivered to each of plural coil receiving portions arranged in said inserter jig, and said joining pole coil is moved and mounted to said inserter jig.

9. A coil forming insertion method including a coil forming process for forming a joining pole coil constructed by joining plural monopole coils formed by winding an electric wire in a loop shape in a winding jig, a coil moving and mounting process for moving and mounting said joining pole coil from said winding jig to the inserter jig, and a coil insertion process for inserting and arranging said joining pole coil in a slot formed on the inner circumferential face of a stator core from said inserter jig;

wherein, in said coil forming process, plural coil winding frames for forming said monopole coil by winding said electric wire are arranged approximately in a circumferential shape and said joining pole coil is formed by using said winding jig constructed by arranging respective winding axes for winding said electric wire in the respective coil winding frames approximately in parallel with each other, and

in said coil moving and mounting process, said inserter jig has a pushing-out insertion core for pushing-out said joining pole coil toward said slot of said stator core and inserting said joining pole coil into this slot, and also has plural coil receiving portions arranged on the outer circumferential face of the pushing-out insertion core and respectively receiving each monopole coil from each coil winding frame; each coil receiving portion is opposed to the tip face of each coil winding frame in the direction of said winding axis and each coil winding frame and each coil receiving portion are connected by using said inserter jig; and each of each coil winding frame and each coil receiving portion forms a moving and mounting route for moving and mounting each monopole coil, and each monopole coil is delivered from each coil winding frame to each coil receiving portion while each moving and mounting route is maintained within the ring of each monopole coil.

10. The coil forming insertion method according to claim 8 or 9, wherein each monopole coil is delivered from each coil winding frame to each coil receiving portion in a state in which the tip portion of said coil receiving portion is fitted into a fitting concave portion formed on said tip face of each coil winding frame in said coil moving and mounting process.

11. The coil forming insertion method according to any one of claims 8 to 10, wherein an expelling core arranged on the inner circumferential side of each coil winding frame is

advanced in the advancing direction on the side opposed to said inserter jig, and each monopole coil delivered to each coil receiving portion is pushed out until a predetermined position in said inserter jig in said coil moving and mounting process.

12. The coil forming insertion method according to any one of claims 8 to 11, wherein each monopole coil is separated from each coil winding frame by reducing the outside diameter of each coil winding frame, and each monopole coil is delivered from each coil winding frame to each coil receiving portion in said coil moving and mounting process.

13. The coil forming insertion method according to claim 12, wherein, in said coil forming process, the monopole coil having a winding diameter of said electric wire increased toward said advancing direction is formed by forming a state in which the outside diameter of the coil winding frame for winding said electric wire is stepwise increased in the advancing direction on the side opposed to said inserter jig, and

in said coil moving and mounting process, each monopole coil is separated from each coil winding frame by forming a state in which the outside diameter of each coil winding frame is reduced toward said advancing direction.